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[Title of Invention] IMAGE REPRODUCING METHOD AND APPARATUS
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[Title of the Invention] IMAGE REPRODUCING METHOD AND
APPARATUS

[What Is Claimed Is:]

5 [Claim 1] An image reproducing method
characterized by performing image reproduction
processing in which an image sensing signal obtained by
an image sensing device is converted into a
visualizable image signal, and comprising

10 determining at least one of a plurality of image
reproduction parameters used at the time of said image
reproduction, on the basis of at least another image
reproduction parameter.

[Claim 2] The image reproducing method according
15 to claim 1, characterized in that
said image reproduction parameters are a white
balance coefficient and a complementary color-pure
color conversion function, and
said complementary color-pure color conversion
20 function is determined on the basis of said white
balance coefficient.

[Claim 3] An image reproducing apparatus
characterized in that said apparatus performs image
reproduction processing in which an image sensing
25 signal obtained by an image sensing device is converted
into a visualizable image signal, and comprises

means for determining at least one of a plurality of image reproduction parameters used at the time of said image reproduction, on the basis of at least one other image reproduction parameter.

5 [Claim 4] The image reproducing apparatus according to claim 3, characterized in that

said image reproduction parameters are a white balance coefficient and a complementary color-pure color conversion function, and

10 said image reproduction parameter determining means determines said complementary color-pure color conversion function on the basis of said white balance coefficient.

[Claim 5] The image reproducing apparatus according to claim 4, characterized in that said image reproduction parameter determining means comprises storage means for storing a reference complementary color-pure color conversion function, and altering means for altering the reference

20 complementary color-pure color conversion function in accordance with a predetermined alteration rule on the basis of the white balance coefficient, thereby determining a complementary color-pure color conversion function in accordance with the white balance
25 coefficient.

[Claim 6] The image reproducing apparatus

according to claim 4, characterized in that said image reproduction means comprises

storage means for storing a plurality of the complementary color-pure color conversion functions

5 previously determined in accordance with a plurality of light source conditions, and

selecting means for selecting one of the plurality of complementary color-pure color conversion functions stored in said storage means in accordance with the
10 white balance coefficient.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention]

The present invention relates to an image
15 reproducing method and apparatus and, more particularly, is preferably applied to an image reproducing method for performing image reproduction processing to convert an image sensing signal obtained from an image sensing device, such as an image sensing tube or a CCD, into a
20 visualizable image signal (e.g., an NTSC-RGB signal) and a color image reproducing apparatus utilizing the method.

[0002]

[Prior Art]

25 In a conventional television camera using an image sensing device such as an image sensing tube or a CCD,

predetermined processing is performed using various image reproduction parameters upon image reproduction processing for converting an image sensing signal obtained by the image sensing device into a

5 visualizable image signal. In order to constantly obtain images which apparently give the same impression or to obtain as faithful reproduced images as possible regardless of deterioration with time of the image sensing device or a color filter and changes in an

10 illuminating light source, image reproduction parameters are generally determined from the image sensing signal itself. For example, such processing is performed for correcting a color temperature.

[0003]

15 In a television camera of this type, the correction of the color temperature is to adjust a so-called white balance so that an object (or an object to be photographed) which is supposed to look white accurately looks white. Generally, this color

20 temperature correction is performed by determining a white portion from the data obtained by the image sensing operation. That is, image data which is supposed to look white is extracted from image data, and a white balance coefficient as one image

25 reproduction parameter is determined on the basis of the extracted data.

[0004]

Usually, in the white balance adjustment, a plurality of color component signals constituting an output image signal from an image sensing device are 5 respectively multiplied with gains by using the white balance coefficient to correct the color temperature. Consequently, the output levels of the color components constituting the image signal of the object which is supposed to look white are so adjusted as to be equal 10 to each other.

[0005]

An example of a mechanism for actually performing the above-described color temperature correction which has been conventionally commonly employed is shown in 15 Fig. 4. Referring to Fig. 4, complementary color data (consisting of color component signals of magenta Ma, green Gr, yellow Ye, and cyan Cy) obtained by an image sensing unit 1 is supplied to a complementary color-pure color converting unit 11. The complementary color 20 data is converted into pure color data (consisting of color component signals of red R, green G, and blue B) in the complementary color-pure color converting unit 11. The white balance of the pure color data obtained by the complementary color-pure color converting unit 25 11 is adjusted by a white balance (WB) adjusting unit 12 in the subsequent stage, and the gamma of the data

is corrected by a gamma correcting unit 4.

[0006]

In the configuration shown in Fig. 4, the WB adjusting unit 12 is arranged subsequently to the 5 complementary color-pure color converting unit 11, and the color temperature correction is done by performing the white balance adjustment for the pure color data (R,G,B) after complementary colors are converted into pure colors. This configuration is advantageous in 10 that the color temperature correction can be relatively easily performed because the gain of the pure color data (R,G,B) can be directly adjusted.

[0007]

Alternatively, the white balance adjustment has 15 been recently frequently performed by an image reproducing apparatus of the configuration shown in Fig. 5. In the configuration shown in Fig. 5, a WB adjusting unit 2 adjusts the white balance of complementary color data (Ma,Gr,Ye,Cy) obtained by an 20 image sensing unit 1. Thereafter, a complementary color-pure color converting unit 3 performs complementary color-pure color conversion to obtain pure color data (R,G,B). This configuration has the advantage that a luminance signal with a higher 25 resolution than that obtained in the configuration shown in Fig. 4 can be easily obtained.

[0008]

[Problems That the Invention Is to Solve]

The hue of an image is generally adjusted by adjusting the white balance as follows. An object
5 which is supposed to look white under a certain photographing light source is photographed. The amplification factor of each of a plurality of color component signals constituting an image signal obtained from the image sensing device is so adjusted that the
10 white object accurately looks white when the image signal is reproduced. That is, it can be considered that the white balance adjustment is performed to compensate for changes in the light source during photography.

15 [0009]

Commonly, the white balance adjustment described above is a principal means for compensating for changes in the light source during photography. A white balance coefficient used in this white balance
20 adjustment is obtained on the basis of information of the light source during photography.

[0010]

Of a plurality of different image reproduction parameters used in image reproduction, some parameters
25 are preferably obtained on the basis of information of the light source during photography, like the image

reproduction parameter (white balance coefficient) used in the white balance adjustment. An example is a complementary color-pure color conversion matrix used to convert an image sensing signal obtained by using a 5 complementary color filter into a pure color signal.

[0011]

- The complementary color-pure color conversion matrix is determined by the spectral transmittance characteristic of a complementary color filter.
- 10 Usually, the spectral transmittance characteristic of a complementary color filter differs from an ideal characteristic. The influence of this difference from the ideal characteristic changes in accordance with the characteristics of the light source during photography.
- 15 That is, a complementary color-pure color conversion matrix optimally selected under a certain photographing light source gives an optimum complementary color-pure color conversion result under this light source. However, this matrix generally does not give suitable 20 conversion results to all light sources.

[0012]

- When a photographing light source changes, therefore, it is desirable to change the complementary color-pure color conversion matrix in accordance with 25 the light source. Also, the above two image reproduction parameters, i.e., the white balance

coefficient and the complementary color-pure color conversion matrix, are related to each other under a certain photographing light source. Accordingly, it is undesirable to individually determine these parameters.

5 [0013]

However, in a conventional image reproducing apparatus, the complementary color-pure color conversion as described above is performed by using a semi-fixed complementary color-pure color conversion 10 matrix which is optimally set under a certain photographing light source. If the photographing light source changes, therefore, the influence of the difference of the spectral transmittance characteristic of a complementary color filter from the ideal 15 characteristic increases. Also, a contradiction sometimes occurs between the white balance coefficient and the complementary color-pure color conversion matrix having the correlation. Consequently, no complementary color-pure color conversion can be 20 properly performed, and this makes faithful reproduction of an image difficult.

[0014]

The present invention has been made to solve the above problems, and has as its object to constantly 25 perform appropriate complementary color-pure color conversion, thereby enabling faithful and accurate

reproduction of images even if the photographing light source changes.

[0015]

[Means of Solving the Problems]

5 The present invention provides an image reproducing method for performing image reproduction processing in which an image sensing signal obtained by an image sensing device is converted into a visualizable image signal, comprising determining at 10 least one of a plurality of image reproduction parameters used at the time of the image reproduction, on the basis of at least one other image reproduction parameter.

[0016]

15 The present invention is further characterized in that the image reproduction parameters are a white balance coefficient and a complementary color-pure color conversion function and the complementary color-pure color conversion function is determined on the 20 basis of the white balance coefficient.

[0017]

 The present invention also provides an image reproducing apparatus for performing image reproduction processing in which an image sensing signal obtained by 25 an image sensing device is converted into a visualizable image signal, comprising means for

determining at least one of a plurality of image reproduction parameters used at the time of the image reproduction, on the basis of at least one other image reproduction parameter.

5 [0018]

The present invention is further characterized in that the image reproduction parameters are a white balance coefficient and a complementary color-pure color conversion function and the image reproduction 10 parameter determining means determines the complementary color-pure color conversion function on the basis of the white balance coefficient.

[0019]

The present invention is further characterized in 15 that the image reproduction parameter determining means comprises storage means for storing a reference complementary color-pure color conversion function, and altering means for altering the reference complementary color-pure color conversion function in accordance with 20 a predetermined alteration rule on the basis of the white balance coefficient to determine a complementary color-pure color conversion function in accordance with the white balance coefficient.

[0020]

25 The present invention is further characterized in that the image reproduction parameter determining means

comprises storage means for storing a plurality of complementary color-pure color conversion functions previously determined in accordance with a plurality of light source conditions, and selecting means for

5 selecting one of the plurality of complementary color-pure color conversion functions stored in the storage means in accordance with the white balance coefficient.

[0021]

[Operation of the Invention]

10 The present invention comprises the above technical means and enables an image sensing signal to be converted into an image signal by using an image reproduction parameter group consisting of more accurate image reproduction parameters without any

15 contradiction between correlated image reproduction parameters or inefficient determination of image reproduction parameters, which occurred in the prior art wherein the respective image reproduction parameters were individually determined.

20 [0022]

For example, when a white balance coefficient and a complementary color-pure color conversion function are used as image reproduction parameters, the complementary color-pure color conversion function is

25 determined on the basis of the white balance coefficient determined in accordance with the condition

of a photographing light source. For this reason,
there exists no contradiction between the complementary
color-pure color conversion function and the white
balance coefficient, and a more accurate complementary
5 color-pure color conversion function can be obtained in
accordance with the condition of the photographing
light source.

[0023]

[Embodiments]

- 10 As described above with respect to the conventional example, various image reproduction parameters used to obtain an optimum reproduced image in image reproduction processing may be associated with each other via a certain photographing light source.
- 15 In this case, the association between these image reproduction parameters is fully utilized, i.e., one parameter is obtained by using information that another parameter has. Consequently, the image reproduction processing can be efficiently and accurately performed.
- 20 The present invention has been made to realize this processing.

[0024]

An image reproducing method according to the present invention and a color image reproducing apparatus to which the method is applied will be described below with reference to embodiments shown in

the accompanying drawings.

Fig. 1 is a schematic block diagram showing the overall configuration of a color image reproducing apparatus according to the first embodiment using a 5 single-sensor color camera which uses a complementary color imager as an image sensing device.

[0025]

Usually, a color image reproducing apparatus performs various processes necessary to reproduce color 10 images. Therefore, an ordinary color image reproducing apparatus requires mechanisms for performing various processes not clearly illustrated in Fig. 1. Although these mechanisms are necessary in this embodiment, Fig. 1 shows minimum necessary mechanisms for explaining the 15 processing and the configuration related to this embodiment.

[0026]

The color image reproducing apparatus of this embodiment shown in Fig.1 comprises an image sensing 20 unit 1, a white balance (WB) adjusting unit 2, a complementary color-pure color converting unit 3, a gamma correcting unit 4, and a complementary color-pure color conversion function determining unit 5. This complementary color-pure color conversion function 25 determining unit 5 has a reference function storage 5a and a function converter 5b.

[0027]

The image sensing unit 1 has, e.g., a single-sensor color camera using a complementary color imager. The image sensing unit 1 senses the image of an object 5 (not shown) and outputs two-dimensional digital data consisting of four different color components, magenta Ma, green Gr, yellow Ye, and cyan Cy, in accordance with complementary color filters of these colors, as the image sensing data of the object.

10 [0028]

By using the two-dimensional digital data output from the image sensing unit 1, the WB adjusting unit 2 extracts photographing light source information of the image sensing data (e.g., color temperature information 15 or color component signals (Ma,Gr,Ye,Cy) corresponding to the photographing light source) and, on the basis of the photographing light source information, obtains so-called white balance coefficients. The white balance is adjusted by adjusting the gains of these color component signals (Ma,Gr,Ye,Cy) by using the white balance coefficients.

20 [0029]

Assuming that the white balance coefficients are represented by ($k_{Ma}, k_{Gr}, k_{Ye}, k_{Cy}$), complementary color data 25 (Ma',Gr',Ye',Cy') after the white balance adjustment are respectively represented by

$$Ma' = K_{Ma} \cdot Ma$$

$$Gr' = K_{Gr} \cdot Gr$$

$$Ye' = K_{Ye} \cdot Ye$$

$$Cy' = K_{Cy} \cdot Cy$$

5 [0030]

The complementary color-pure color converting unit 3 performs color space conversion for the complementary color data (Ma' , Gr' , Ye' , Cy') whose white balance is adjusted by the WB adjusting unit 2, thereby obtaining 10 pure color data (R, G, B) as a reproduction image signal. As an example, this complementary color-pure color converting unit 3 converts the complementary color data (Ma' , Gr' , Ye' , Cy') after the white balance adjustment into NTSC-RGB data.

15 [0031]

Generally, the conversion from the complementary color data (Ma' , Gr' , Ye' , Cy') into the pure color data (R, G, B) is performed on the basis of functions f_R , f_G , and f_B (to be collectively referred to as a function f 20 hereinafter unless it is necessary to distinguish between them). That is,

$$R = f_R(Ma', Gr', Ye', Cy')$$

$$G = f_G(Ma', Gr', Ye', Cy')$$

$$B = f_B(Ma', Gr', Ye', Cy')$$

25 This function f is described by using a matrix or a lookup table (LUT), for example.

[0032]

In order to optimally display and record images, the gamma correcting unit 4 corrects the pure color data (R,G,B), which constitute the reproduction image signal obtained by the complementary color-pure color converting unit 3, by using the characteristics of an image displaying-recording apparatus (not shown), and outputs the corrected component signals (R',G',B') as a display recording signal.

10 [0033]

By using the photographing light source information or the white balance coefficients as more practical parameters obtained by the WB adjusting unit 2, the complementary color-pure color conversion function determining unit 5 obtains the complementary color-pure color conversion function f to be used in the complementary color-pure color converting unit 3. The complementary color-pure color conversion function f obtained by the complementary color-pure color conversion function determining unit 5 is supplied to the complementary color-pure color converting unit 3. On the basis of the supplied conversion function f , the complementary color-pure color converting unit 3 converts the complementary color data (Ma' , Gr' , Ye' , Cy') into the pure color data (R,G,B).

[0034]

The color image reproducing apparatus with the above configuration primarily has its characteristic features in the processes and mechanisms of the WB adjusting unit 2, the complementary color-pure color 5 converting unit 3, and the complementary color-pure color conversion function determining unit 5. That is, the color image reproducing apparatus of this embodiment comprises the complementary color-pure color conversion function determining unit 5 for obtaining 10 the complementary color-pure color conversion function f used by the complementary color-pure color converting unit 3 to convert the complementary color data (Ma', Gr', Ye', Cy') into the pure color data (R, G, B) .
The color image reproducing apparatus of this 15 embodiment is characterized in that this complementary color-pure color conversion function determining unit 5 receives the photographing light source information or the white balance coefficients obtained by the WB adjusting unit 2 and obtains the complementary color- 20 pure color conversion function f on the basis of the received information.

[0035]

This characteristic feature will be described in detail below. Assume a complementary color-pure color 25 conversion function (daylight complementary color-pure color conversion functions $f_{R,D65}$, $f_{G,D65}$, and $f_{B,D65}$; to be

collectively referred to as f_{D65} hereinafter) which is optimally set, e.g., on the basis of daylight (e.g., a D65 light source described by JIS) is previously stored as a reference complementary color-pure color

- 5 conversion function in the reference function storage
5a of the complementary color-pure color conversion
function determining unit 5.

[0036]

- The WB adjusting unit 2 extracts photographing
10 light source information from image sensing data and obtains white balance coefficients for adjusting the gains of color component signals (Ma,Gr,Ye,Cy) on the basis of the light source information. The WB adjusting unit 2 performs white balance adjustment by
15 balancing the color component signals (Ma,Gr,Ye,Cy) by using the white balance coefficients. Consequently, a change in the photographing light source is compensated for.

[0037]

- 20 The photographing light source information and the white balance coefficients obtained when this white balance adjustment is performed are supplied to the complementary color-pure color conversion function determining unit 5. On the basis of the photographing
25 light source information and the white balance coefficients ($k_{Ma}, K_{Gr}, K_{Ye}, K_{Cy}$) supplied from the WB

adjusting unit 2, the function converter 5b in the complementary color-pure color conversion function determining unit 5 alters the above-mentioned reference complementary color-pure color conversion function fD65 5 and obtains the complementary color-pure color conversion function f corresponding to the white balance coefficients (k_{Ma} , K_{Gr} , K_{Ye} , K_{Cy}). Note that the procedure of this alteration is previously described.

[0038]

10 For example, assume that the alteration procedure is given as follows:

$$f_R(Ma', GR', Ye', Cy') = f_{R,D65}(Ma', GR', Ye', Cy', k_{Ma}, K_{Gr}, K_{Ye}, K_{Cy})$$

$$f_G(Ma', GR', Ye', Cy') = f_{G,D65}(Ma', GR', Ye', Cy', k_{Ma}, K_{Gr}, K_{Ye}, K_{Cy})$$

$$f_B(Ma', GR', Ye', Cy') = f_{B,D65}(Ma', GR', Ye', Cy', k_{Ma}, K_{Gr}, K_{Ye}, K_{Cy})$$

15 When arbitrary white balance coefficients (k_{Ma} , K_{Gr} , K_{Ye} , K_{Cy}) are supplied, the function f is uniquely determined in accordance with the white balance coefficients.

[0039]

20 The complementary color-pure color conversion function f obtained by the complementary color-pure color conversion function determining unit 5 in accordance with the photographing light source as described above is supplied to the complementary color-pure color converting unit 3. The complementary color-pure color conversion function f is used by the 25

complementary color-pure color converting unit 3 in the processing of converting the complementary color data (Ma' , Gr' , Ye' , Cy') into pure color data (R,G,B).

[0040]

5 Fig. 2 is a schematic block diagram showing the overall configuration of a color image reproducing apparatus according to the second embodiment. Note that the same reference numerals as in the color image reproducing apparatus shown in Fig. 1 denote parts
10 having the same functions in Fig. 2, and a detailed description thereof will be omitted.

[0041]

The color image reproducing apparatus of this second embodiment primarily has its characteristic
15 features in the processes and mechanisms of a WB adjusting unit 2, a complementary color-pure color converting unit 3, a complementary color-pure color conversion function selecting unit 6, and a complementary color-pure color conversion function
20 storage unit 7.

[0042]

That is, in the color image reproducing apparatus of this embodiment, complementary color-pure color conversion functions f used in the complementary color-pure color converting unit 3 to convert complementary color data (Ma' , Gr' , Ye' , Cy') into pure color data

(R,G,B) are previously obtained for several photographing light sources. The apparatus comprises the complementary color-pure color conversion function storage unit 7 for storing and holding these

5 complementary color-pure color conversion functions f and the complementary color-pure color conversion function selecting unit 6 for selecting one of the plurality of complementary color-pure color conversion functions f stored in the complementary color-pure

10 color conversion function storage unit 7.

[0043]

The apparatus of this embodiment is characterized in that the complementary color-pure color conversion function selecting unit 6 receives photographing light source information or white balance coefficients from the WB adjusting unit 2 and selects a proper complementary color-pure color conversion function f from the complementary color-pure color conversion function storage unit 7 on the basis of the information.

20 [0044]

That is, in this embodiment, a plurality of complementary color-pure color conversion functions f are prepared for several predicted photographing light sources and stored in the complementary color-pure

25 color conversion function storage unit 7. The complementary color-pure color conversion function

selecting unit 6 analyzes the photographing light source information or the white balance coefficients obtained by the WB adjusting unit 2, selects a complementary color-pure color conversion function f

5 corresponding to the photographing light source from the complementary color-pure color conversion function storage unit 7, and supplies the selected complementary color-pure color conversion function f to the complementary color-pure color converting unit 3.

10 [0045]

In this second embodiment, it is unnecessary to alter the conversion function such as done in the complementary color-pure color conversion function determining unit 5 of the first embodiment. That is,

15 it is only necessary to select an appropriate complimentary color-pure color conversion function f from the complementary color-pure color conversion function storage unit 7. Consequently, the processing can be performed at a higher speed than in the first

20 embodiment.

[0046]

The third embodiment of the present invention will be described below. Fig. 3 is a block diagram showing an outline of the overall configuration of a color image reproducing apparatus according to the third embodiment. In the first and second embodiments

described above, photographing light source information is obtained from image sensing data from the image sensing unit 1. However, in this third embodiment, the photographing light source information is directly 5 obtained from a light source used in photography.

[0047]

That is, as illustrated in Fig.13, the color image reproducing apparatus of this embodiment comprises a photographing light source detecting unit 9 and a WB coefficient determining unit 10. In this configuration, 10 the photographing light source detecting unit 9 detects or senses photographing light source information with respect to image sensing data output from an image sensing unit 1. The WB coefficient determining unit 10 determines a white balance coefficient on the basis of 15 the detected or sensed photographing light source information. The WB coefficient determining unit 10 supplies the white balance coefficient thus determined to a WB adjusting unit 2 and a complementary color-pure 20 color conversion function determining-selecting unit 8.

[0048]

On the basis of the supplied white balance coefficient, the WB adjusting unit 2 adjusts the white balance. The complementary color-pure color conversion 25 function determining-selecting unit 8 calculates or selects a complementary color-pure color conversion

function f corresponding to the photographing light source. This processing of calculating the complementary color-pure color conversion function f is performed in the same manner as in the first embodiment.

- 5 The processing of selecting the complementary color-pure color conversion function f is performed in the same way as in the second embodiment.

[0049]

The complementary color-pure color conversion function f thus calculated or selected by the complementary color-pure color conversion function determining-selecting unit 8 is supplied to a complementary color-pure color converting unit 3 where the function is used in complementary color-pure color conversion.

[0050]

In addition to the configuration shown in Fig. 3 in which both the photographing light source detecting unit 9 and the image sensing unit 1 are juxtaposed in the apparatus and the photographing light source is constantly detected, there can be a configuration where the image sensing unit 1 is separately arranged and supplies image sensing data to the apparatus by some means. For example, if information of the photographing light source is added to the image sensing data, photographing light source information

may be detected from the additional data.

[0051]

The rest of the configuration and operation of the image reproducing apparatus according to the third embodiment shown in Fig.13 is almost the same as the configurations and operations of the first and second embodiments described above, and so a detailed description thereof will be omitted. Refer to the above description to understand this embodiment.

10 [0052]

In the first to third embodiments as described above, a complementary color-pure color conversion function as one of a plurality of image reproduction parameters constituting an image reproduction parameter group is calculated on the basis of a white balance coefficient as another image reproduction parameter. Therefore, the white balance and the complementary color-pure color conversion function associated with the white balance can be efficiently and accurately set without producing any contradiction between them. Consequently, images can be properly reproduced in accordance with the photographing light source.

[0053]

As described above, the principal object of this embodiment is to calculate a certain image reproduction parameter from another relevant image reproduction

parameter, thereby accurately reproducing images.

Examples of image reproduction parameters constituting an image reproduction parameter group are parameters describing a color temperature, a white balance

- 5 coefficient, a color component gain, white point information, black point information, a gamma coefficient, a gradation characteristic, a gradation conversion curve, a gradation conversion lookup table, a knee point, a dynamic range, a color gamut, light
- 10 source information, a color coordinate conversion matrix coefficient, a spatial frequency characteristic, a black (gray) balance coefficient, an S/N ratio, an auto-correlation coefficient, a Wiener spectrum, an intensity (density) distribution, and a luminance
- 15 distribution, and parameters obtained directly or indirectly from these information.

[0054]

Note that the present invention is not limited to the disclosure set forth with reference to the first to 20 third embodiments as described above and various sequence processing operations can be applied without departing from the scope and spirit of the present invention. For example, the present invention may be theorized or implemented in software. Alternatively, 25 the present invention may be applied to a hardware or apparatus which operates in accordance with an

algorithm or the like created without departing the scope and spirit of the present invention as described above.

[0055]

5 [Effect of the Invention]

As described above, according to the present invention, at least one of a plurality of different image reproduction parameters used in the conversion from an image sensing signal to an image signal is obtained from at least another image reproduction parameter. Accordingly, it is possible to avoid the inconveniences, when these image reproduction parameters are individually determined, that a contradiction occurs between correlated image reproduction parameters and parameters are determined inefficiently in a conventional case. Consequently, image sensing signals can be converted into image signals by using an image reproduction parameter group consisting of more accurate image reproduction parameters corresponding to the condition of the photographing light source. This makes accurate and desired image reproduction feasible.

[Brief Description of the Drawings]

[Fig. 1]

25 Fig. 1 is a block diagram showing an outline of the configuration of a color image reproducing apparatus

according to the first embodiment of the present invention.

[Fig. 2]

Fig. 2 is a block diagram showing the schematic 5 configuration of a color image reproducing apparatus according to the second embodiment of the present invention.

[Fig. 3]

Fig. 3 is a block diagram showing the schematic 10 configuration of a color image reproducing apparatus according to the third embodiment of the present invention.

[Fig. 4]

Fig. 4 is a schematic block diagram showing an example 15 of a conventional image reproducing apparatus.

[Fig. 5]

Fig. 5 is a schematic block diagram showing another example of a conventional image reproducing apparatus.

[Description of the Reference Numerals]

- | | | |
|----|---|---|
| 20 | 1 | image sensing unit |
| | 2 | WB adjusting unit (for complementary color) |
| | 3 | complementary color-pure color converting |
| 25 | | unit |
| | 4 | gamma correcting unit |

5 complementary color-pure color
conversion
 function determining unit
5a reference function storage
5 5b function converter
6 complementary color-pure color
conversion
 function selecting unit
7 complementary color-pure color
10 conversion
 function storing-holding unit
8 complementary color-pure color
conversion
 function determining-selecting unit
15 9 photographing light source detecting
unit
10 WB coefficient determining unit

[Type of the Document] Abstract

[Abstract]

[Problem] It is an object of the present invention to constantly perform appropriate complementary color-pure
5 color conversion, thereby enabling faithful reproduction of images even if a photographing light source changes.

[Solving Means] A complementary color-pure color conversion function determining unit 5 is provided to
10 calculate a complementary color-pure color conversion function used in complementary color-pure color conversion processing performed in a complementary color-pure color converting unit 3 on the basis of a white balance coefficient which is used in white
15 balance adjustment processing performed in a WB adjusting unit 2. The complementary color-pure color conversion function as one of a plurality of image reproduction parameters used upon image reproduction is obtained on the basis of the white balance coefficient
20 determined in accordance with the photographing light source. As a result, inconveniences that a contradiction occurs between the correlated image reproduction parameters and the parameters are inefficiently determined can be eliminated. Therefore,
25 an image sensing signal can be converted into an image signal by using a more accurate image reproduction

7-205886

parameter determined in accordance with the
photographing light source.

[Selected Drawing] Fig. 1

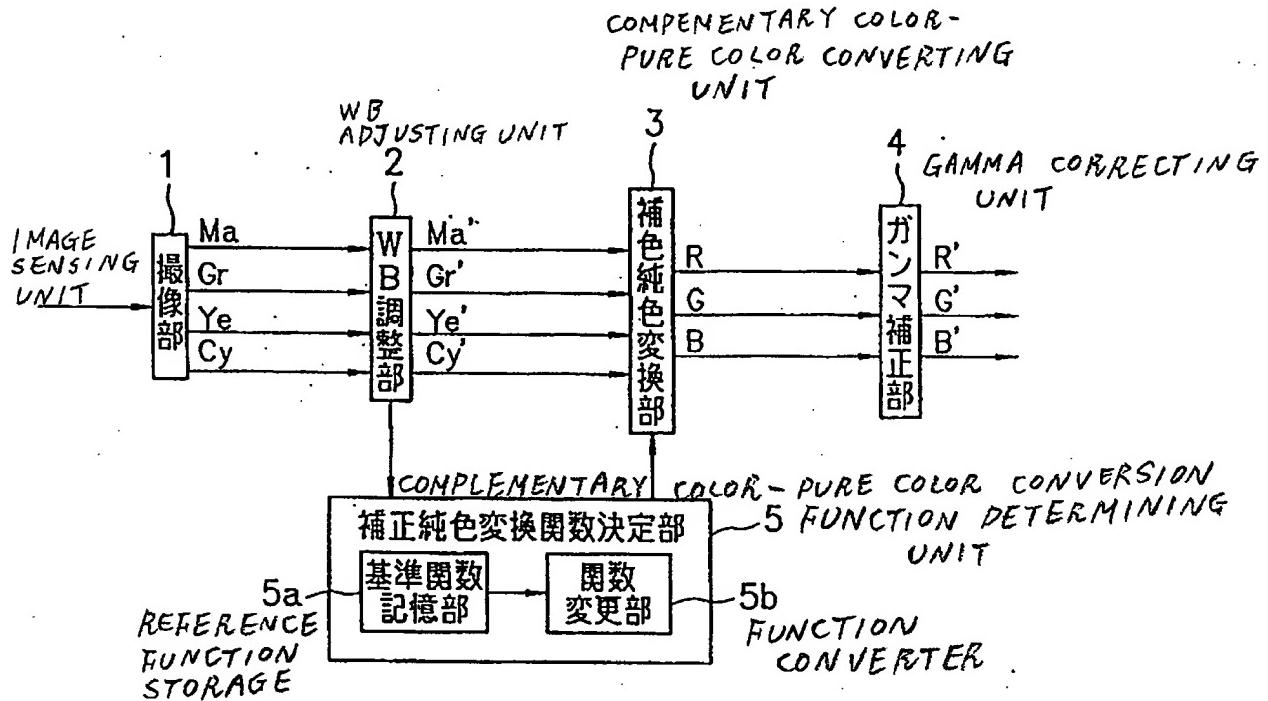
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整理番号 = 2960048

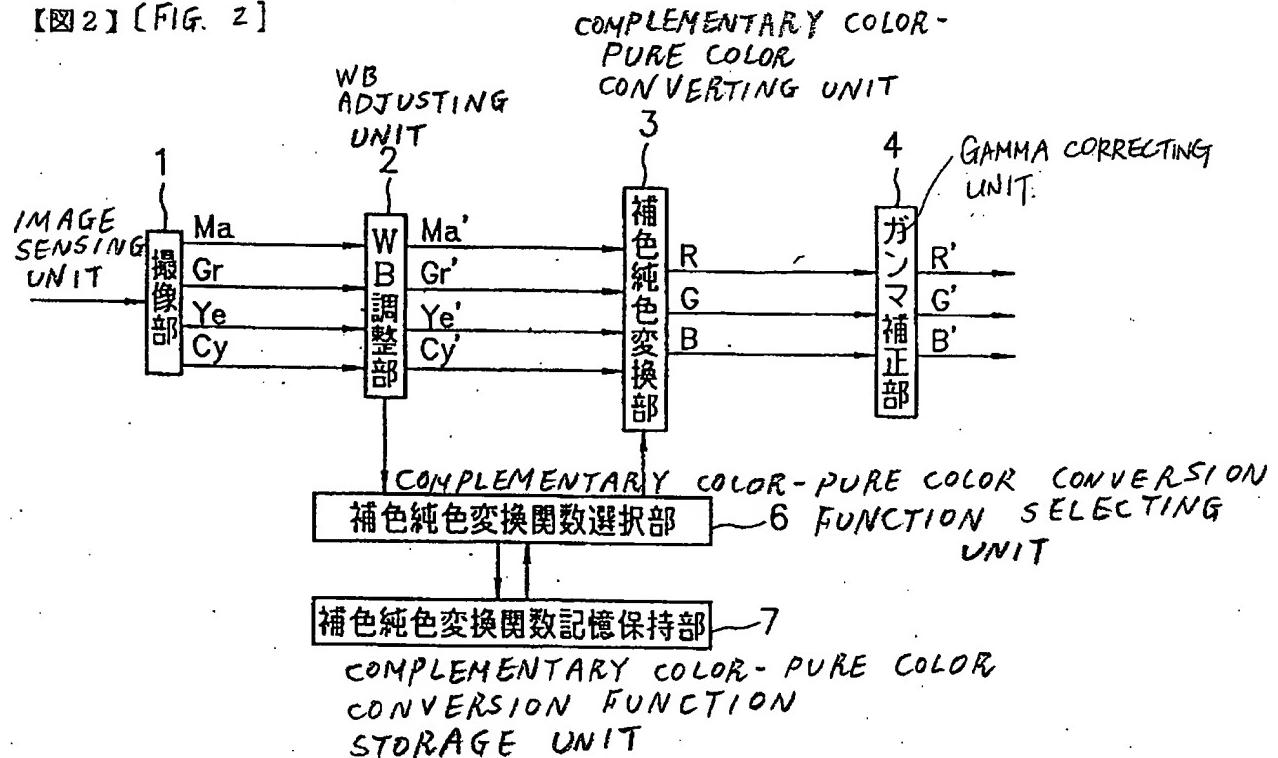
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[TYPE OF THE DOCUMENT] DRAWINGS
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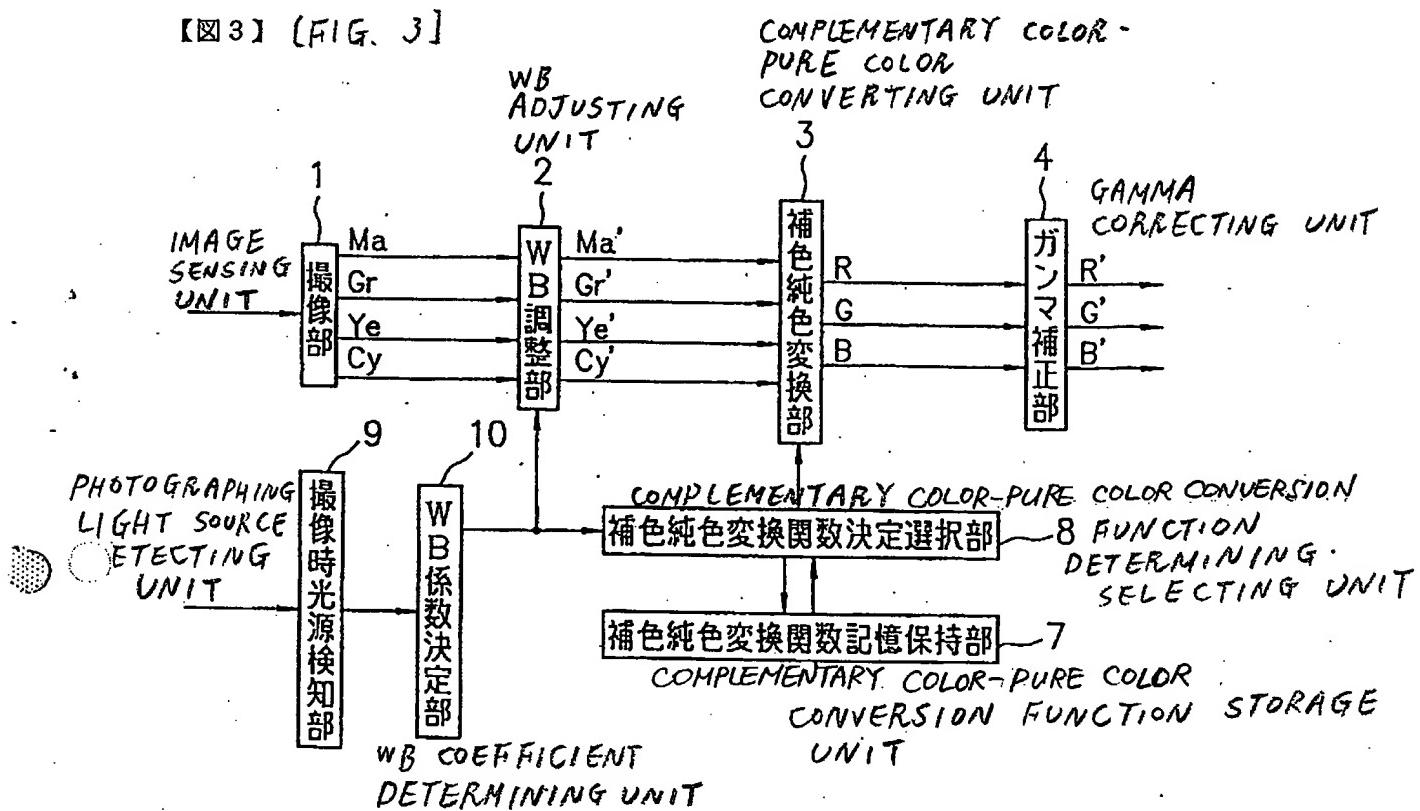
【図1】 [FIG. 1]



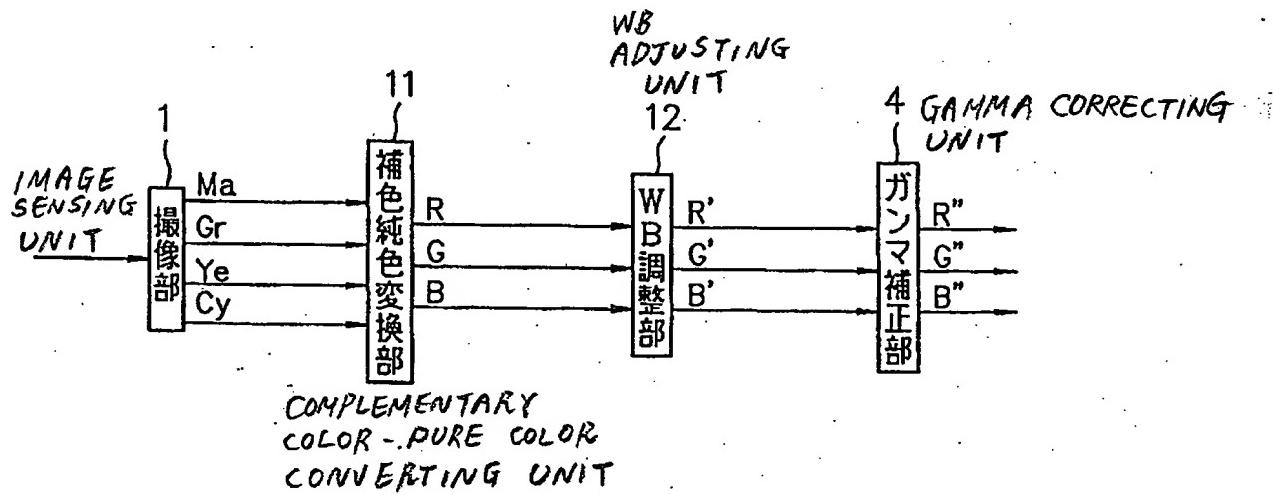
【図2】 [FIG. 2]



【図3】(FIG. 3)



【図4】(FIG. 4)



【図5】 [FIG. 5]

